FilmGrain

Rowan Simmons

Faculty of Computing and Mathematical Sciences, University of Waikato, New Zealand
rsimmons@waikato.ac.nz

Prof. Mark Apperley

Faculty of Computing and Mathematical Sciences, University of Waikato, New Zealand
https://www.cms.waikato.ac.nz/people/mapperle
mapperle@waikato.ac.nz

Chin-En kEiTH Soo

Faculty of Computing and Mathematical Sciences, University of Waikato, New Zealand
http://www.cms.waikato.ac.nz/people/ceks
ceks@waikato.ac.nz

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Premise

Films are an integral part of our cultural zeitgeist, as time goes on, they have become more than entertainment, they have become a mirror that we point at ourselves in order to explore issues and our position in the world. To do this they use a myriad of tools to communicate with us quickly and effectively and from a design perspective this communication is at the very heart of what we do. FilmGrain is designed to visualise the colours of a film in order to explore whether the visual language of colours developed by the director and directory of photography stands up when removed from the context of the visuals. This paper will explain the process by which FilmGrain captures and visualises film colour data.

1. Introduction

Colour has been an inescapable part of the cinematic experience since it was first introduced in the early 20th Century with such films as *With Our King and Queen Through India* [1] and *Cupid Angling* [2]. Colour brings with it all types of connotations and relationships and filmmakers have been using it to help tell their stories ever since those early days. The concept of visualising film colours is not new by any means, in the current form, known colloquially as "movie barcodes", the most prominent practitioners online are moviebarcode.tumblr.com [3] which started in 2011 and thecoloursofmotion.com [4] which appears to have started in 2014. These barcodes take a small sample of frames from the film, calculates the average colour of the frame (earlier versions of this process

were a modified form of slit-scan photography as they simply take a slice of each frame and display them sequentially others compress the frame horizontally until 1 pixel wide which creates an approximate average colour of the frame) and visualises that colour as strips either vertically or horizontally to great effect, however this inadvertently changes the experience of the film as not every frame is represented and those that are can be quite some distance from one another chronologically. As shown in Figure 1, one frame is captured every ten seconds meaning that for 2001: A Space Odyssey, the visual can only display a total of 894 of 204,224 possible frames.
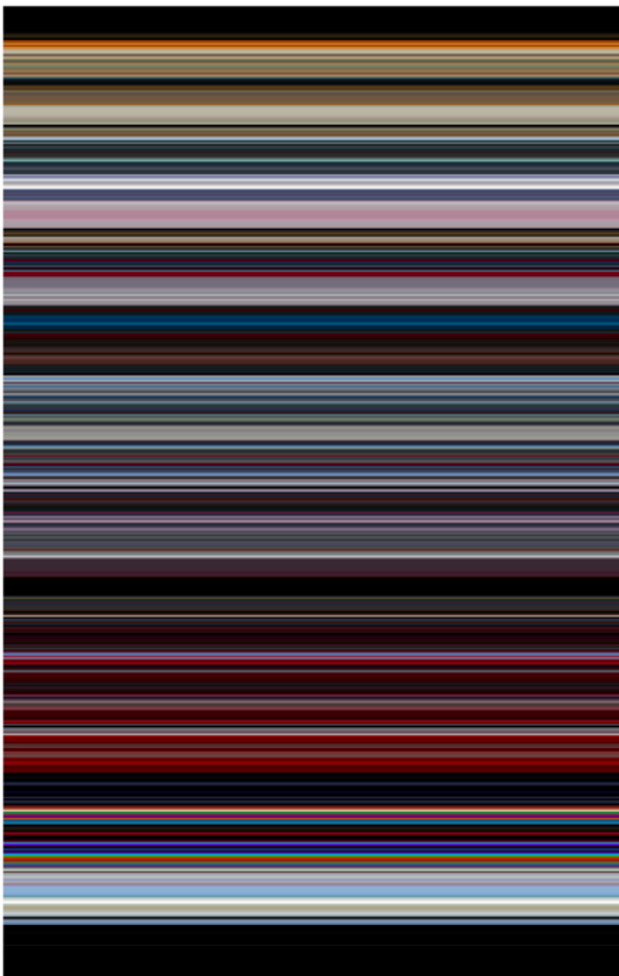

Figure 1 - 2001: A Space Odyssey by Stanley Kubrick as visualised by thecolorsofmotion.com

2. FilmGrain process

2.1 Capture

This is where FilmGrain differs, FilmGrain captures every frame from a film using the ffmpeg software [5] as this software is more efficient than anything we have so far come up with and then captures pixels from three locations in each frame (Top Left, Centre, Bottom Right) as shown in Figure 2. Twenty pixels are captured from each location within the frame in order to create a pool of colours that can be drawn from to fit the visualisation to different display resolutions. This results in 60 pixels being captured for every frame, which for a 90-minute film running at 24 frames per second saves 7,776,000 total pixels or 2,592,000 pixels for each screen location. These pools of pixels are saved into text files and loaded only when required.
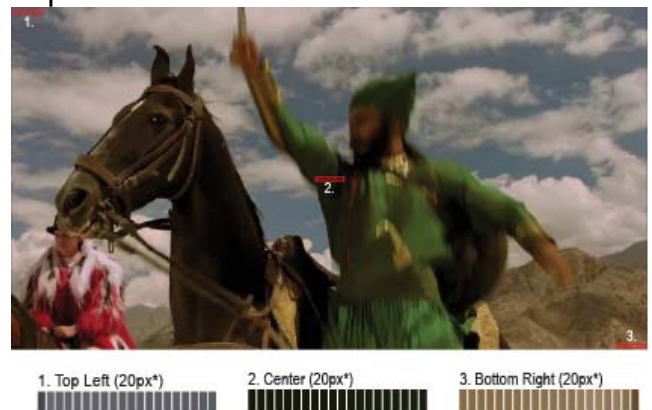

Figure 2 - Pixel capture locations in each frame. For certain films with differing aspect ratios or framing, the position of the right and left capture locations had to be modified to capture the desired data. In future we will seek to do this position calculation work programmatically to avoid accidentally missing the data.

2.2 Calculation

To fit the visualisation to the display resolution FilmGrain uses the following calculation to determine how many pixels to take from each pool:

$$\frac{Width \times Height}{Number\ Of\ Film\ Frames} = \begin{array}{l}Number\ of\ pixels\ to \\ display\ per\ frame\end{array}$$

Figure 2 - Pixel calculation to fit visualisation to screen

This calculation has a drawback in that due to the inability to display partial pixels, the calculation rounds to whole integers and due to the variability of the lengths of films and display resolutions, film often do not fit completely on the screen and will appear too short. We have considered stretching the visualisation image to fit but that is an undesirable solution as it would distort the scale of the colours from film to film.

2.3 Construction

FilmGrain then presents the pixels for each location sequentially, left to right, top to bottom on the screen in order to maintain sequence of the frames and to present the film in one screen as shown in Figure 3, with no need for scrolling to see all the data which we feel is an improvement over other approaches.
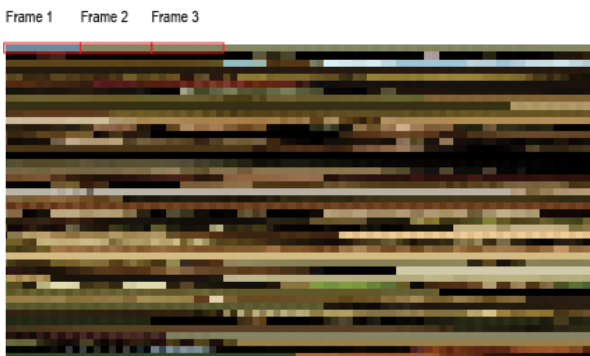

Figure 3- Single panel of visualisation construction, Frame 1 > Frame 2 >

Frame 3> etc...

2.4 Output

The three locations are visualised in their own "panel" to allow comparison of the variations of the colours across the frame. This presentation has the effect of creating a "grain" as the sequences of pixels change, hence the name of the project. Figure 4 shows the typical three panel visualisation of a film by FilmGrain showing top left pixels on the left, centre pixels in the centre and bottom right pixels on the right. These panels are also able to be clicked in order to fill the screen, pixels are reloaded, amounts are recalculated, and the visualisation is redrawn as a single panel over the entire screen.

Figure 4 - The Fall by Tarsem Singh as visualised by FilmGrain

We have found that if people are familiar with the film on display, they can actually "read" the image and identify moments in the film based solely on the colours in the context of the visual narrative. We believe FilmGrain also has utility as a tool for people to use in order to delve into films and start considering the colours of a film as a deliberate choice. This is not just limited to cinephiles, this can be of use to anyone as colour is an integral part of our daily lives and so by really considering colours in the media we consume, we can become more sensitive to visual languages at work in our daily lives.

3. Conclusion

"Movie Barcodes" have become an increasingly interesting medium for visual and data exploration. At the time of writing this paper, the authors have become aware of the work of Jason Salavon, most notably his piece from 2001 titled *MTV's 10 Greatest Music Videos of All Time* [6]. It is a jarring similarity purely because of the identical approach to the presentation of the colours. This clearly indicates that this is an engaging way to approach the visualisation of movie colour and will not be the last time it is discovered.

Full Diagram included on the next page to illustrate entire FilmGrain process.

References:

[1]
https://www.imdb.com/title/tt0008984/

[2]
https://www.imdb.com/title/tt0243880/

[3]
https://moviebarcode.tumblr.com

[4]
https://thecolorsofmotion.com

[5]
https://ffmpeg.org/

[6]
http://www.salavon.com/work/MtvsTop10/image/205/

Figure 2 - FilmGrain pixel capture locations in each frame

| 1. Top Left (20px*) | 2. Center (20px*) | 3. Bottom Right (20px*) |

*20 Pixels saved from each location in order to create a pool of pixels to draw from so that the visualisation works across many different display resolutions.

MovieName_Color_L.txt   MovieName_Color_M.txt   MovieName_Color_R.txt

Calculation to build visualisation: E.g:

$$\frac{Width \times Height}{Number\ Of\ Film\ Frames} = \frac{Number\ of\ pixels\ to}{display\ per\ frame} \qquad \frac{1920 \times 1200}{225,000} = 10\ pixels\ per\ frame$$

Frame 1   Frame 2   Frame 3

Figure 3 - FilmGrain single panel of visualisation construction, Frame 1 > Frame 2 > Frame 3> etc...

Figure 4 - The Fall by FilmGrain